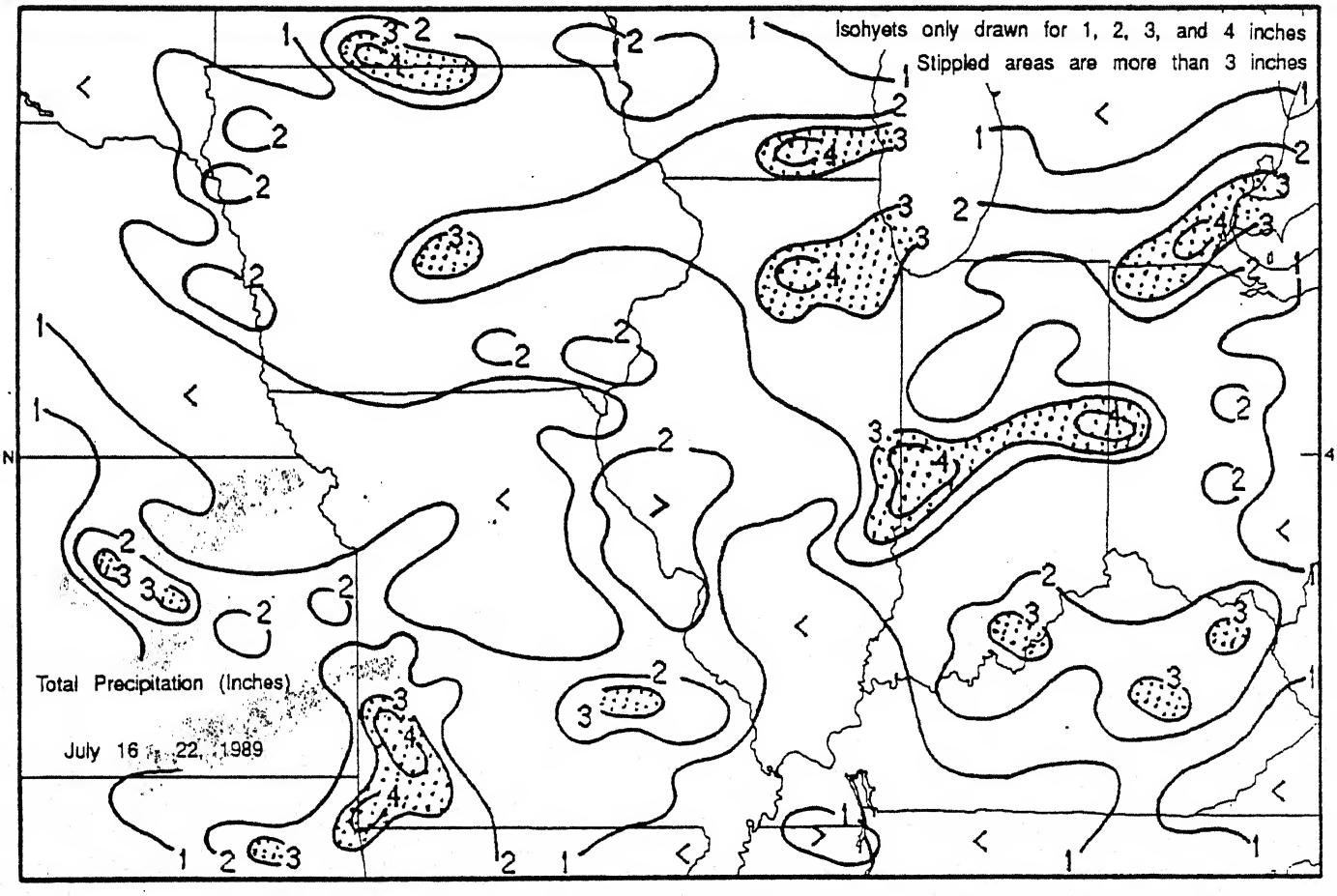
CLIMATE ANALYSIS CENTER

WEEKLY CLIMATE BULLETIN

No. 89/29 **Washington, DC** **July 22, 1989**



WIDESPREAD MODERATE TO HEAVY RAINS BROUGHT SOME RELIEF FROM LONG-TERM DRYNESS IN MOST OF ILLINOIS AND IOWA AND SOUTHERN WISCONSIN BUT CAUSED FLOODING IN PARTS OF THE EXCESSIVELY WET EASTERN CORN BELT. FOR AN UPDATE ON MOISTURE CONDITIONS IN THE MIDWEST, NORTHERN GREAT PLAINS, AND THE CANADIAN PRAIRIE PROVINCES, REFER TO THE SPECIAL CLIMATE SUMMARY.

UNITED STATES DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL WEATHER SERVICE - NATIONAL METEOROLOGICAL CENTER

WEEKLY CLIMATE BULLETIN

This Bulletin is issued weekly by the Climate Analysis Center and is designed to indicate, in a brief concise format, current surface climatic conditions in the United States and around the world. The Bulletin contains:

- Highlights of major climatic events and anomalies.
- U.S. climatic conditions for the previous week.
- U.S. apparent temperatures (summer) or wind chill (winter).
- U.S. cooling degree days (summer) or heating degree days (winter).
- Global two-week temperature anomalies.
- Global four-week precipitation anomalies.
- Global monthly temperature and precipitation anomalies.
- Global three-month precipitation anomalies (once a month).
- Global twelve-month precipitation anomalies (every three months).
- Global three-month temperature anomalies for winter and summer seasons.
- Special climate summaries, explanations, etc. (as appropriate).

Most analyses contained in this Bulletin are based on preliminary, unchecked data received at the Climate Analysis Center via the Global Telecommunications System. Similar analyses based on final, checked data are likely to differ to some extent from those presented here.

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GLOBAL CLIMATE HIGHLIGHTS

MAJOR CLIMATIC EVENTS AND ANOMALIES AS OF JULY 22, 1989

1. Western United States:

HEAT WAVE ENDS.

Near normal temperatures returned to most of the area as very hot conditions were limited to Arizona (see U.S. Weekly Climate Highlights) [Ended at 3 weeks].

2. North Central United States:

RAINS OCCUR, BUT LONG-TERM DRYNESS CONTINUES.

Up to 62 mm of rain fell at some stations, but others reported little or no precipitation as long-term deficits persisted (see Special Climate Summary) [18 weeks].

3. Northeastern United States:

SCATTERED SHOWERS REPORTED.

A few heavy showers dropped as much as 93 mm of rain at some locations as wetness persisted in the Middle Atlantic States (see U.S. Weekly Climate Highlights) [11 weeks].

4. Gulf Coast:

RAINS EASE.

Over 100 mm of rain fell at a few locations; however, light precipitation was recorded at most stations (see U.S. Weekly Climate Highlights) [Ending at 9 weeks].

5. Central South America:

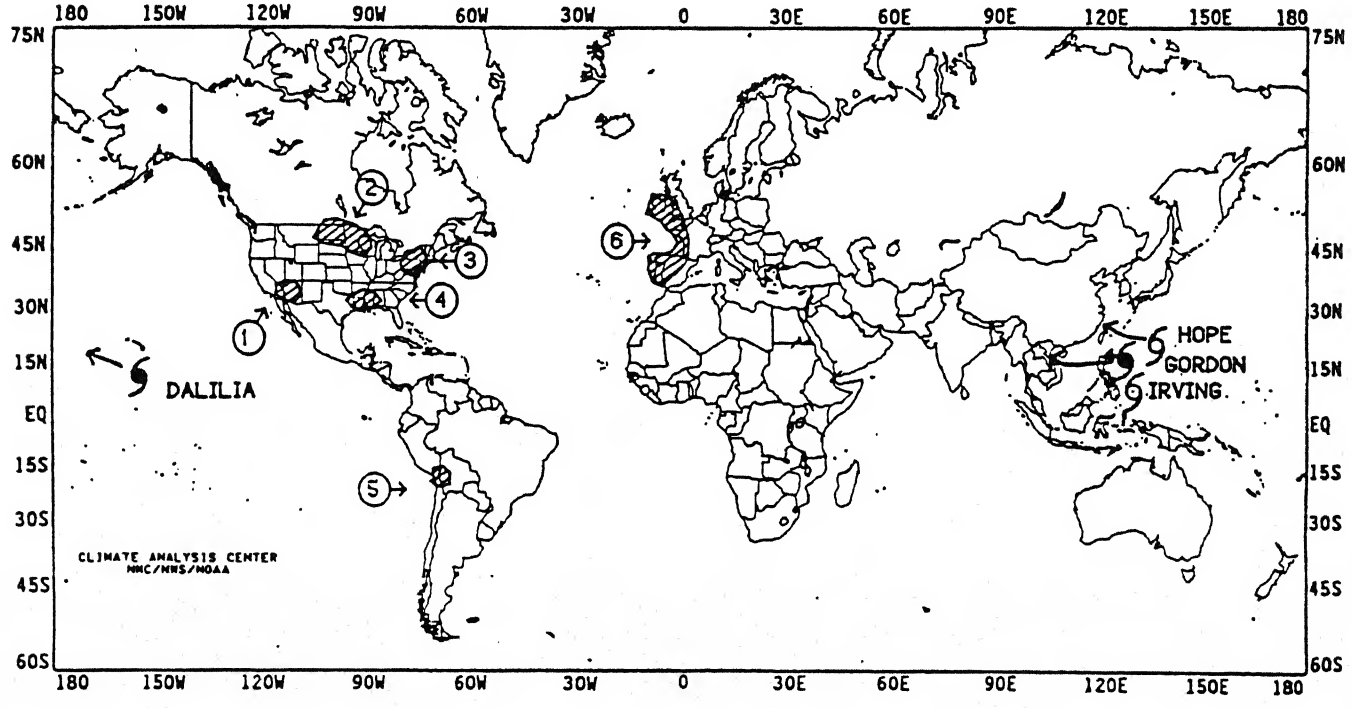
COLD SPELL ENDS.

Near normal temperatures were reported across the area as milder weather returned [Ended at 2 weeks].

6. Western Europe:

HEAT WAVE OCCURS.

Temperatures averaged up to 6°C above normal as hot, dry weather spread across western Europe from Ireland and Scotland to Portugal and Spain [2 weeks].



EXPLANATION

TEXT: Approximate duration of anomalies is in brackets. Precipitation amounts and temperature departures are this week's values.

MAP: Approximate locations of major anomalies and episodic events are shown. See other maps in this bulletin for current two week temperature anomalies, four week precipitation anomalies, long-term anomalies, and other details.

UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

FOR THE WEEK OF JULY 16 THROUGH JULY 22, 1989.

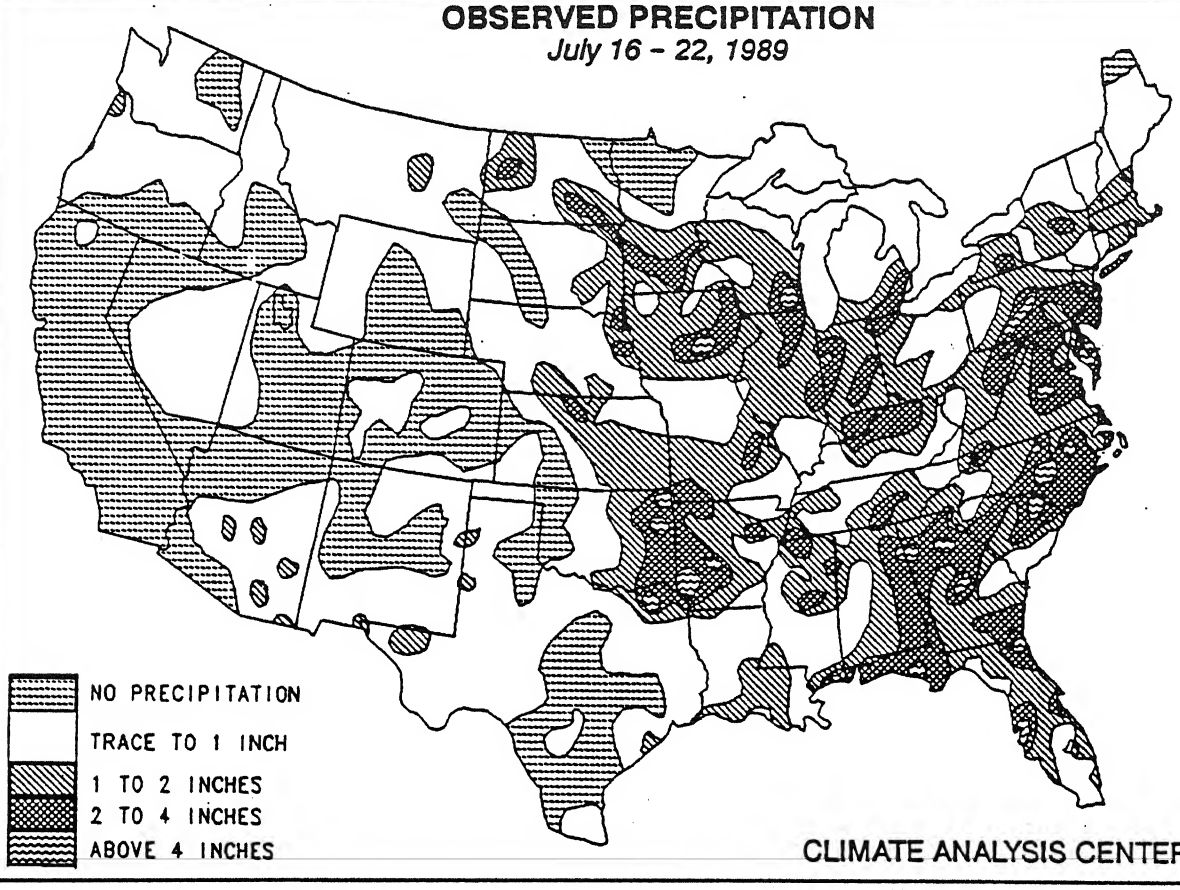
A couple of slow-moving cold fronts, an upper-air disturbance, and warm, moist flow from the Gulf of Mexico and the Atlantic Ocean produced numerous showers and thunderstorms throughout most of the eastern half of the nation last week. Farther west, some relief from extremely hot and dry weather occurred in parts of the Southwest as scattered monsoonal showers and thunderstorms, along with a rare July cold front, brought welcome rains and seasonable temperatures to parts of Arizona and New Mexico. In Hawaii, the center of Tropical Storm Dalilia passed 160 miles to the south of Honolulu on Friday as gusty winds, rough surf, and heavy rains were observed across most of the islands. Early in the week, several low pressure centers developed along a stationary front, triggering showers and thunderstorms from Arkansas eastward to South Carolina and northward into New England. Some flooding was reported in the central Appalachians as heavy rains fell within short time spans. An upper-air disturbance located over the central Great Plains, fueled by moist and unstable air, generated severe weather in Oklahoma, Kansas, and Arkansas. By mid-week, thunderstorms preceding a slow-moving cold front dumped beneficial rains on the northern Great Plains and Midwest, while a weak frontal system across the Southeast produced a multitude of showers and thunderstorms. Towards the end of the week, a low pressure center over southern Illinois and an associated warm front triggered strong thunderstorms in the Ohio Valley, mid-Atlantic, and Southeast. Widely-scattered thundershowers developed in Arizona as moist air flowed into the Southwest. Phoenix, AZ received 0.01 inches of rain late Friday, its first measurable precipitation since March 26.

During the week, locally heavy rains fell on portions of the central Appalachians, the southern Atlantic states, the south-central Great Plains, the eastern Corn Belt, along the eastern Gulf Coast, and in the Hawaiian Islands (see Table 1). Up to 9.2 inches of rain was recorded in south-central Pennsylvania (see Figure 1), while dozens of locations in Georgia and the Carolinas (see Figure 2) received between 4 and 7 inches, according to the River Forecast Centers. Badly-needed rains occurred in portions of Illinois, Iowa, and Wisconsin, but caused flooding in the already saturated regions of the eastern Corn Belt (see front cover). Elsewhere, moderate to heavy amounts were observed at many stations in the northern two-thirds of the Great Plains, the lower Midwest, the Southeast, and throughout most of the East Coast. Light to moderate totals were reported along the Pacific Northwest Coast, in the northern and southern Rockies, and across most of the eastern half of the U.S. Little or no precipitation fell along the southern half of the Pacific Coast, in the central Rockies, extreme southern Texas, and in the northern sections of Michigan and New England. Continued moderate to heavy rainfall in western and central Alaska has controlled or extinguished forest fires that have burned nearly 35,000 acres in the state's interior.

Early in the week, hot weather scorched most of the desert Southwest, the Rockies, and the Plains as highs soared into the upper nineties and one hundreds. However, cooler air from Canada slipped southward into the nation's midsection later in the week. As a result, the greatest positive departures (between +4°F and +6°F) were found in the desert Southwest, the Great Basin, and in the extreme northern Plains (see Table 2). Slightly above normal temperatures were recorded in most of the western third of the country, the northern and southern Great Plains, along the Gulf Coast, and in southern Florida. On Thursday, Phoenix, AZ set its all-time highest daily minimum temperature with a LOW of 93°F. In contrast, the combination of cloudiness and precipitation early in the week and the presence of a strong Canadian high pressure center during the remainder of the week kept the central Great Plains and middle Mississippi Valley unseasonably cool. Temperatures averaged between 7°F and 9°F below normal throughout Missouri, Arkansas, and Kansas (see Table 3). The rest of the eastern half of the country experienced near to slightly below normal temperatures as did the Pacific Northwest. Seasonable temperatures generally prevailed throughout Alaska and Hawaii.

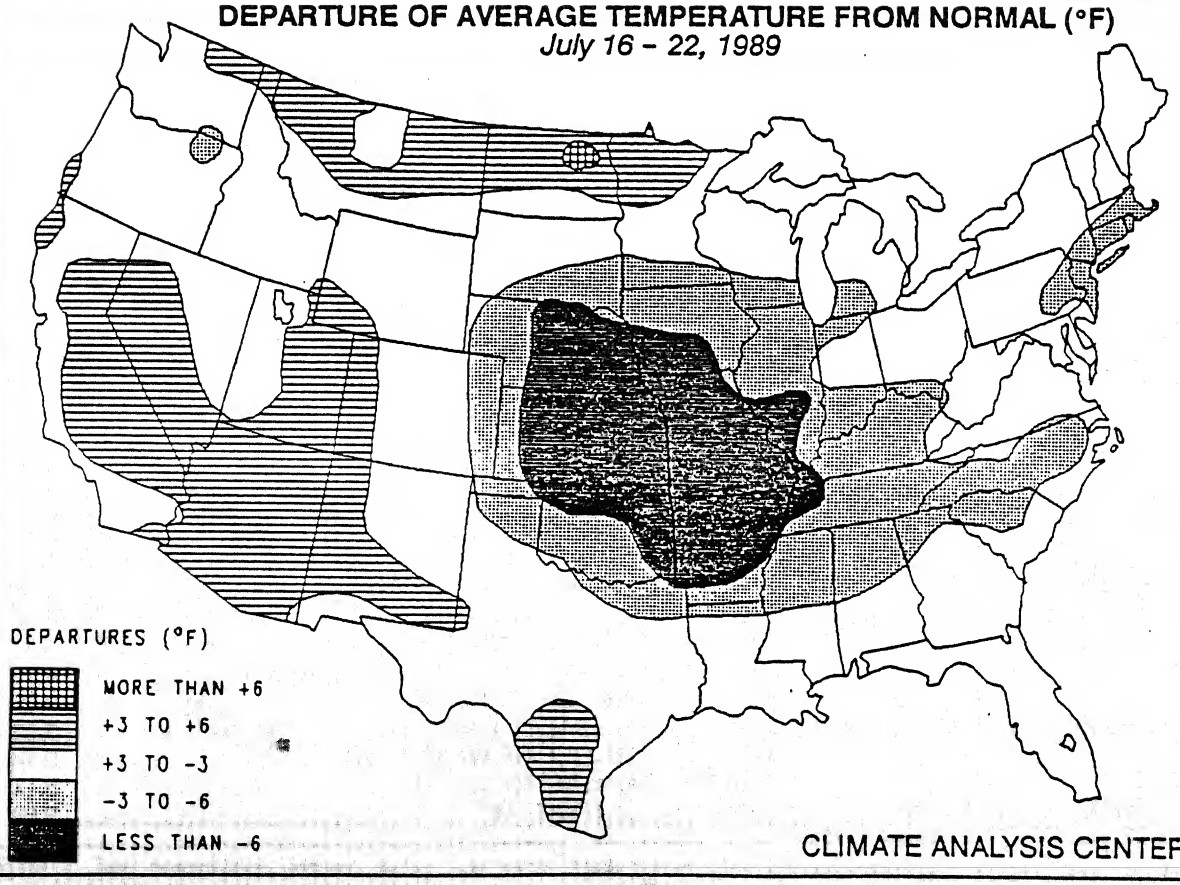
OBSERVED PRECIPITATION

July 16 - 22, 1989



DEPARTURE OF AVERAGE TEMPERATURE FROM NORMAL (°F)

July 16 - 22, 1989



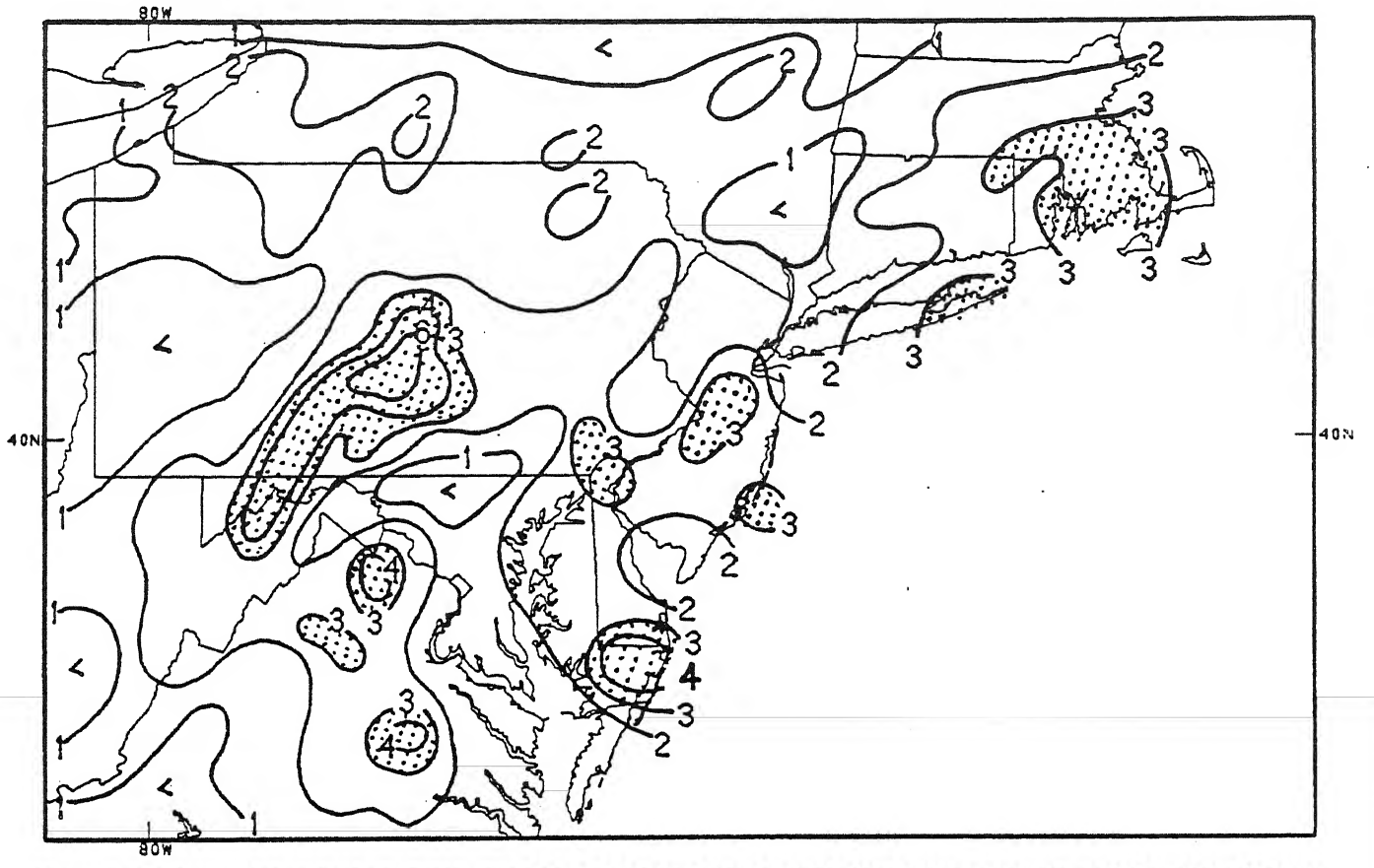


Figure 1. Total precipitation (inches) during July 16-22, 1989 based upon first-order synoptic, airways, and the River Forecast Centers stations. Isohyets are only drawn for 1, 2, 3, 4, and 6 inches, and stippled areas are more than 3 inches. Torrential downpours caused some flooding in the central Appalachians, especially in south-central Pennsylvania, where up to 9.2 inches of rain fell during the week.

TABLE 1. Selected stations with 3.00 or more inches of precipitation for the week.

STATION	TOTAL (INCHES)	STATION	TOTAL (INCHES)
HILO/LYMAN, HAWAII, HI	9.61	PROVIDENCE, RI	3.66
PANAMA CITY/TYNDALL AFB, FL	5.95	ATLANTA, GA	3.61
JACKSONVILLE/CECIL AFB, FL	5.34	MILWAUKEE, WI	3.54
KOKEE, KAUAI, HI	4.80	SOUTH WEYMOUTH, MA	3.54
MACON/WARNER-ROBINS AFB, GA	4.75	WILMINGTON, NC	3.52
FAYETTEVILLE/POPE AFB, NC	4.58	JACKSONVILLE, FL	3.49
WRIGHTSTOWN/MC GUIRE AFB, NJ	4.54	CAPE CANAVERAL AFS, FL	3.45
TAMPA/MAC DILL AFB, FL	4.54	DOVER AFB, DE	3.42
FLORENCE, SC	4.39	CHICAGO/O'HARE, IL	3.35
BILOXI/KEESLER AFB, MS	4.25	WASHINGTON/DULLES, VA	3.35
ALTOONA, PA	4.23	LOUISVILLE, KY	3.33
SALISBURY, MD	4.19	FALMOUTH/OTIS AFB, MA	3.31
	3.99	FAYETTEVILLE/FT BRAGG AFB, NC	3.29
	3.84	PHILADELPHIA, PA	3.25
HNSON AFB, NC	3.82	PENSACOLA NAS, FL	3.23
	3.81	SUMTER/SHAW AFB, SC	3.14
	3.78	APALACHICOLA, FL	3.14
	3.70	DETROIT, MI	3.04

TABLE 2. Selected stations with temperatures averaging 4.0°F or more ABOVE normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
VICTORVILLE/GEORGE AFB, CA	+6.6	85.9	SITKA, AK	+4.5	59.4
PRESCOTT, AZ	+6.2	79.8	TUCSON, AZ	+4.4	90.8
PHOENIX, AZ	+5.8	98.6	CORDOVA/MILE 13, AK	+4.4	59.0
RENO, NV	+5.8	75.9	LAS VEGAS, NV	+4.3	95.2
BEEVILLE NAS, TX	+5.6	89.8	INTERNATIONAL FALLS, MN	+4.3	70.8
VALDEZ, AK	+5.5	59.1	WILLISTON, ND	+4.1	75.0
GRAND FORKS, ND	+5.2	74.4	RUMFORD, ME	+4.1	71.7
EUREKA, CA	+5.2	61.5	YUMA, AZ	+4.0	98.1
GLENDALE/LUKE AFB, AZ	+4.7	96.2	MCALLEN, TX	+4.0	88.5
GLASGOW, MT	+4.7	76.1	WINNEMUCCA, NV	+4.0	76.7
KODIAK, AK	+4.6	59.2			

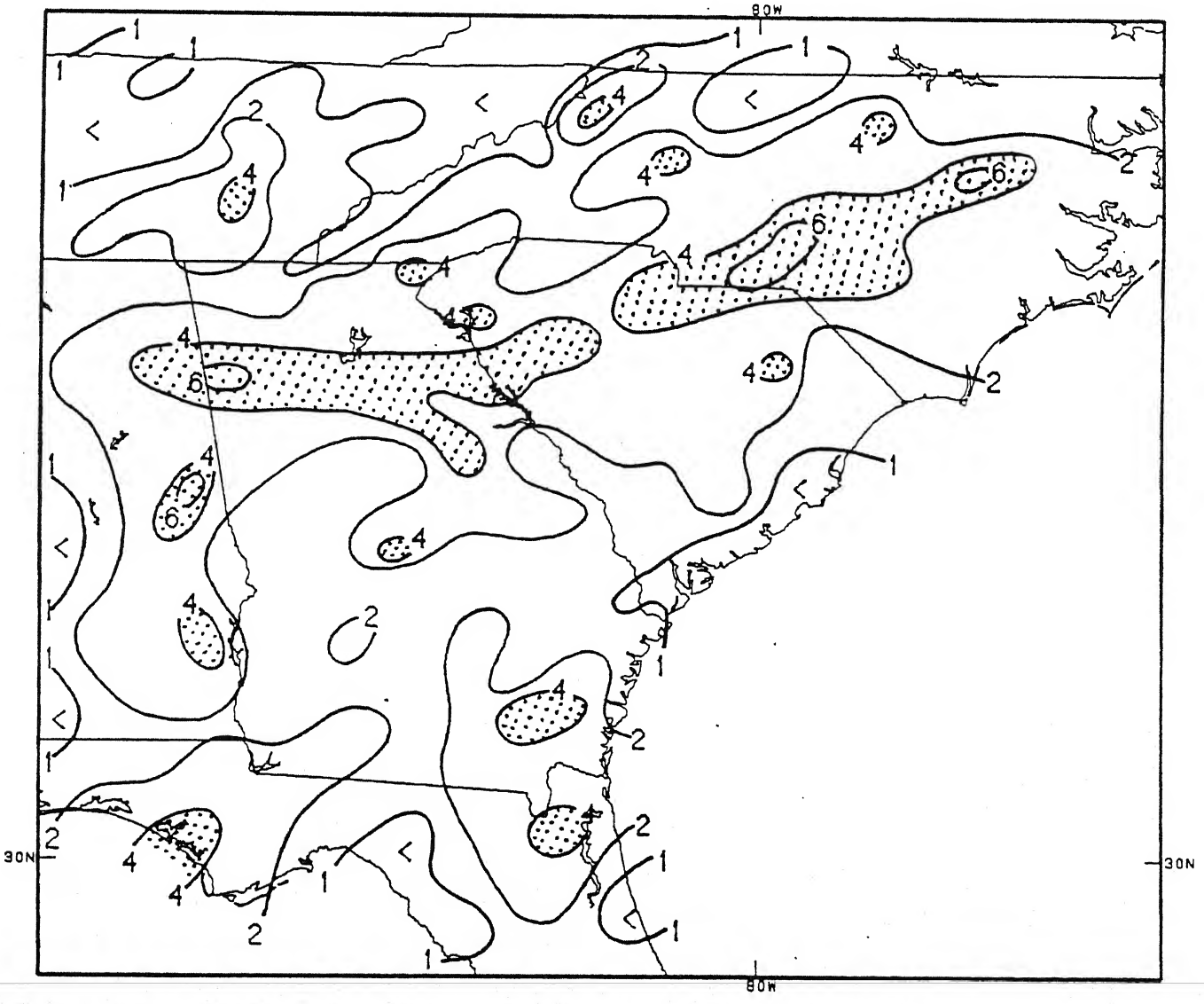
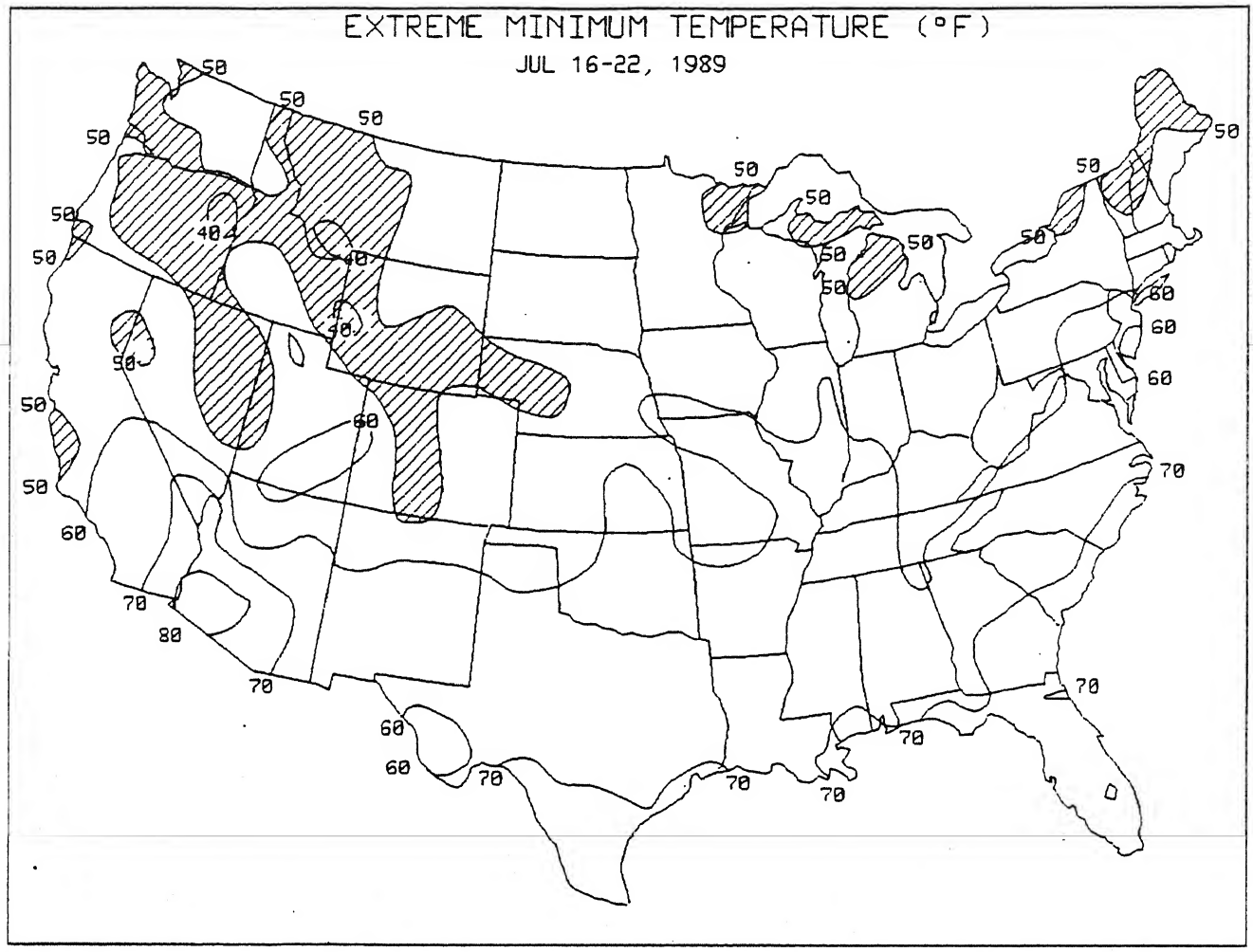


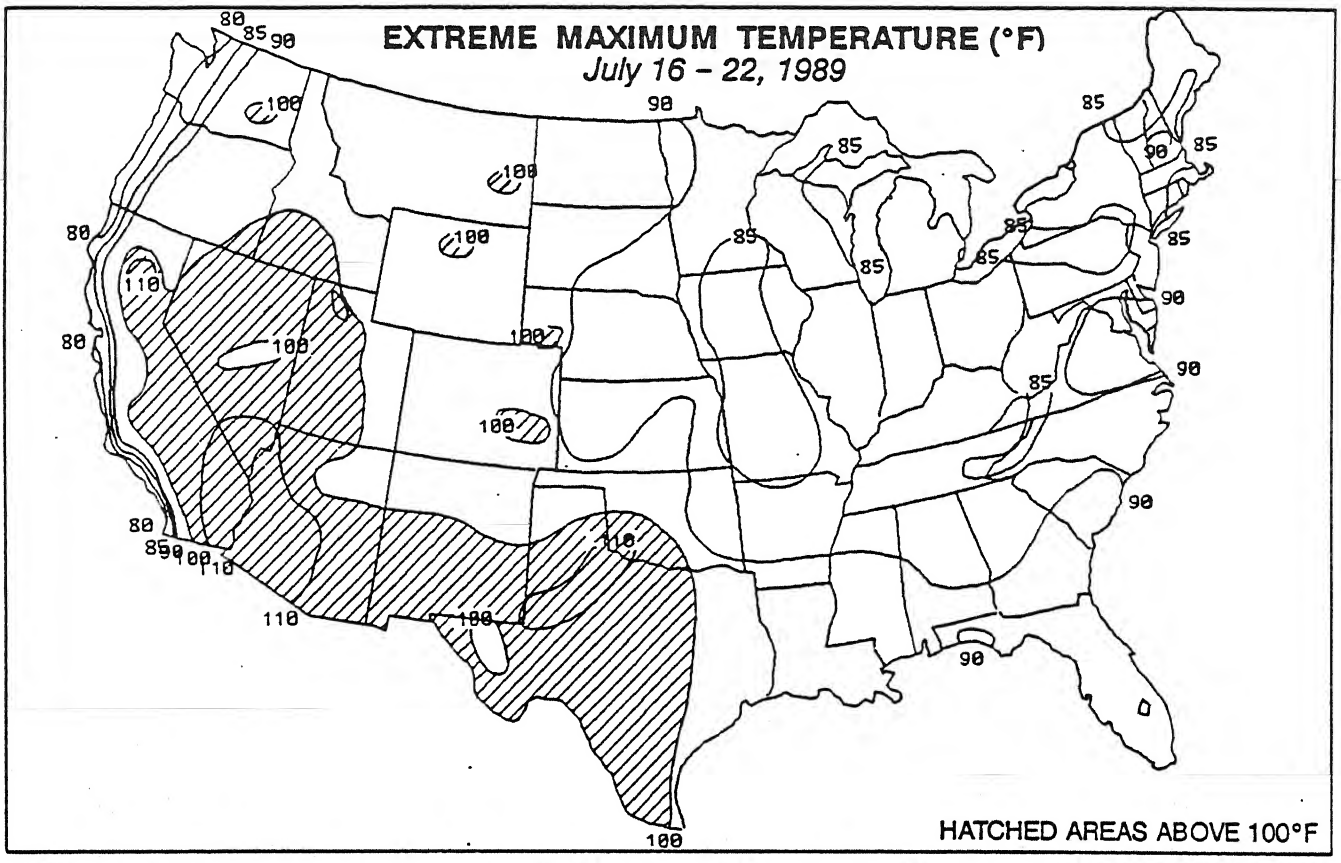
Figure 2. Total precipitation (inches) during July 16-22, 1989 based upon first-order synoptic, airways, and the River Forecast Centers stations. Isohyets are only drawn for 1, 2, 4, and 6 inches, and stippled areas are more than 4 inches. A cold front stalled across the Southeast last week, producing numerous showers and thunderstorms that dumped more than 4 inches of rain on northern Georgia and the central Carolinas.



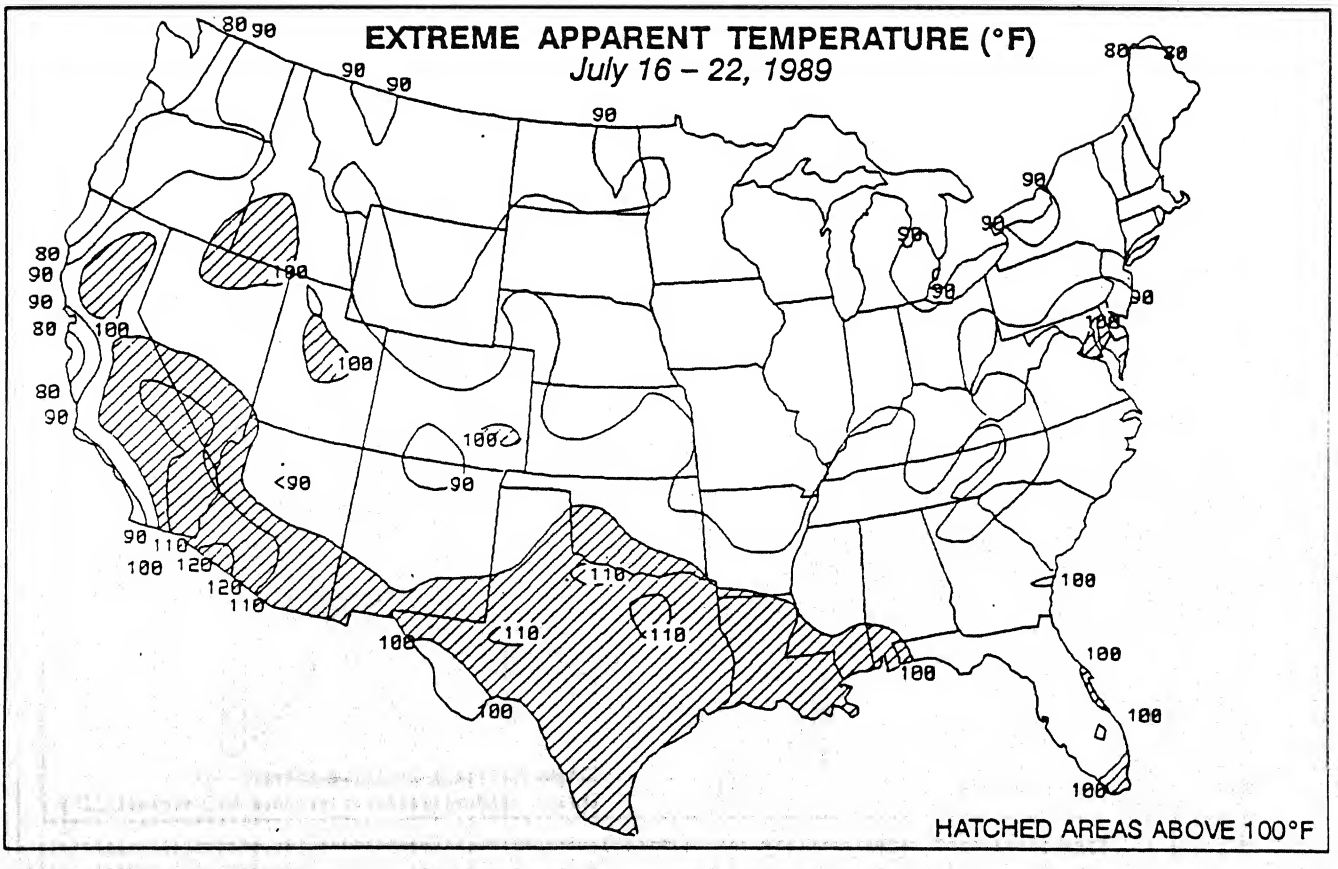
Extreme minimum temperatures (°F) during the week of July 16-22, 1989. Isotherms are drawn every 10°F (starting at 40°F), and shaded areas are less than 50°F. Cooler air (less than 50°F) was confined to the northern halves of the Rockies and Intermountain West, the western Great Lakes, and northern New England while warm and muggy air kept lows in the seventies along the Gulf and southern Atlantic Coasts.

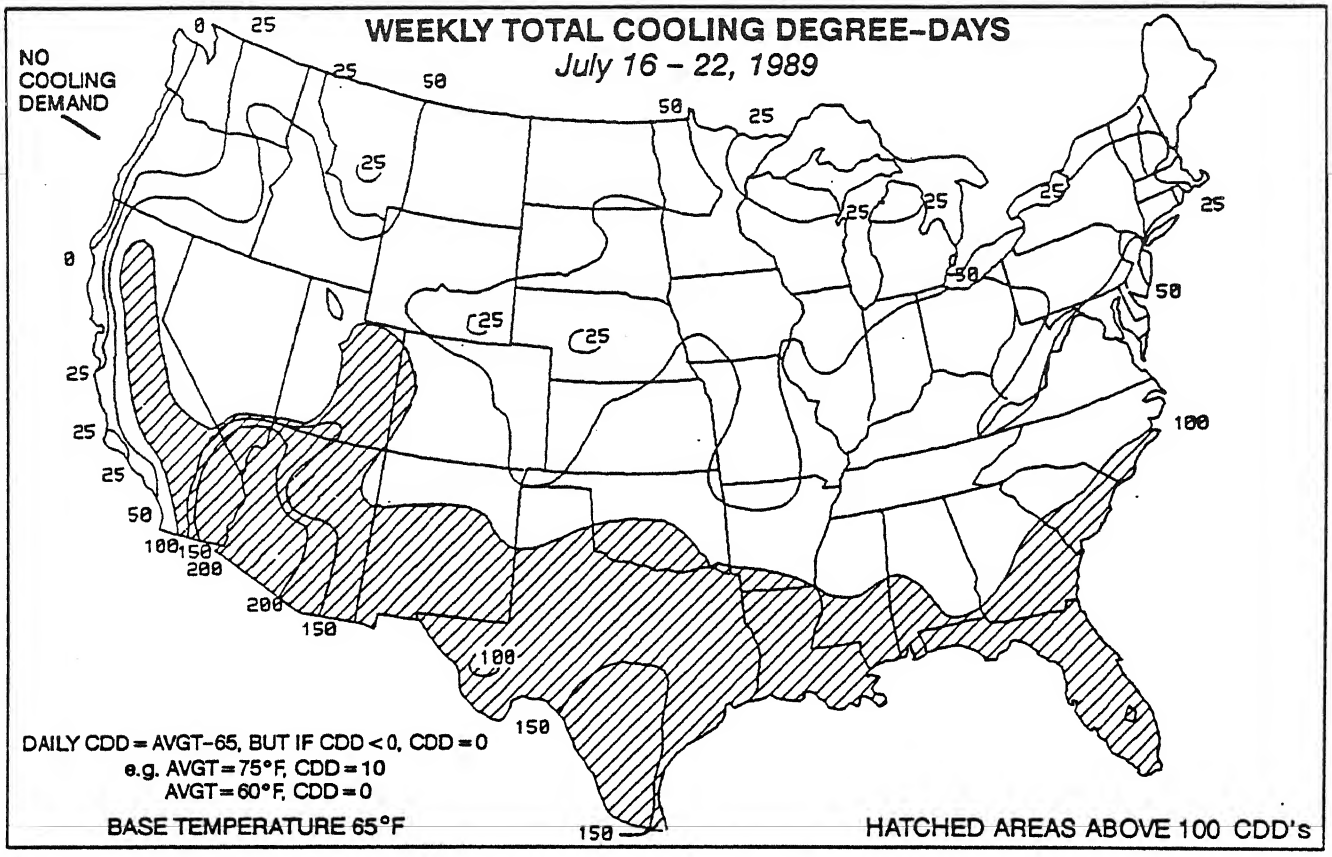
TABLE 3. Selected stations with temperatures averaging 6.0°F or more BELOW normal for the week.

STATION	DEPARTURE (°F)	AVERAGE (°F)	STATION	DEPARTURE (°F)	AVERAGE (°F)
SPRINGFIELD, MO	-9.1	69.4	CONCORDIA, KS	-7.2	72.6
WEST PLAINS, MO	-9.0	69.2	CHANUTE, KS	-7.1	73.4
JOPLIN, MO	-8.9	71.6	RUSSELL, KS	-7.1	73.4
GARDEN CITY, KS	-8.9	71.7	FORT SMITH, AR	-7.0	75.4
HARRISON, AR	-8.8	69.7	TOPEKA, KS	-6.9	72.1
KANSAS CITY/INTL., MO	-8.5	72.0	BLYTHEVILLE AFB, AR	-6.8	74.8
KANSAS CITY/MUNI., MO	-8.1	73.3	GRAND ISLAND, NE	-6.7	70.4
LITTLE ROCK, AR	-8.0	74.3	BELLEVILLE/SCOTT AFB, IL	-6.7	72.1
COLUMBIA, MO	-7.8	70.9	GOODLAND, KS	-6.4	70.0
FAYETTEVILLE, AR	-7.8	70.9	NORFOLK, NE	-6.3	69.9
GAGE, OK	-7.8	74.1	JONESBORO, AR	-6.3	74.9
DODGE CITY, KS	-7.7	72.8	LINCOLN, NE	-6.2	71.8
NORTH OMAHA, NE	-7.6	70.3	SALINA, KS	-6.2	75.1
TULSA, OK	-7.6	76.0	WICHITA, KS	-6.2	75.5
NORTH PLATTE, NE	-7.5	67.4	PINE BLUFF, AR	-6.1	76.9
MCALESTER, OK	-7.3	75.9			

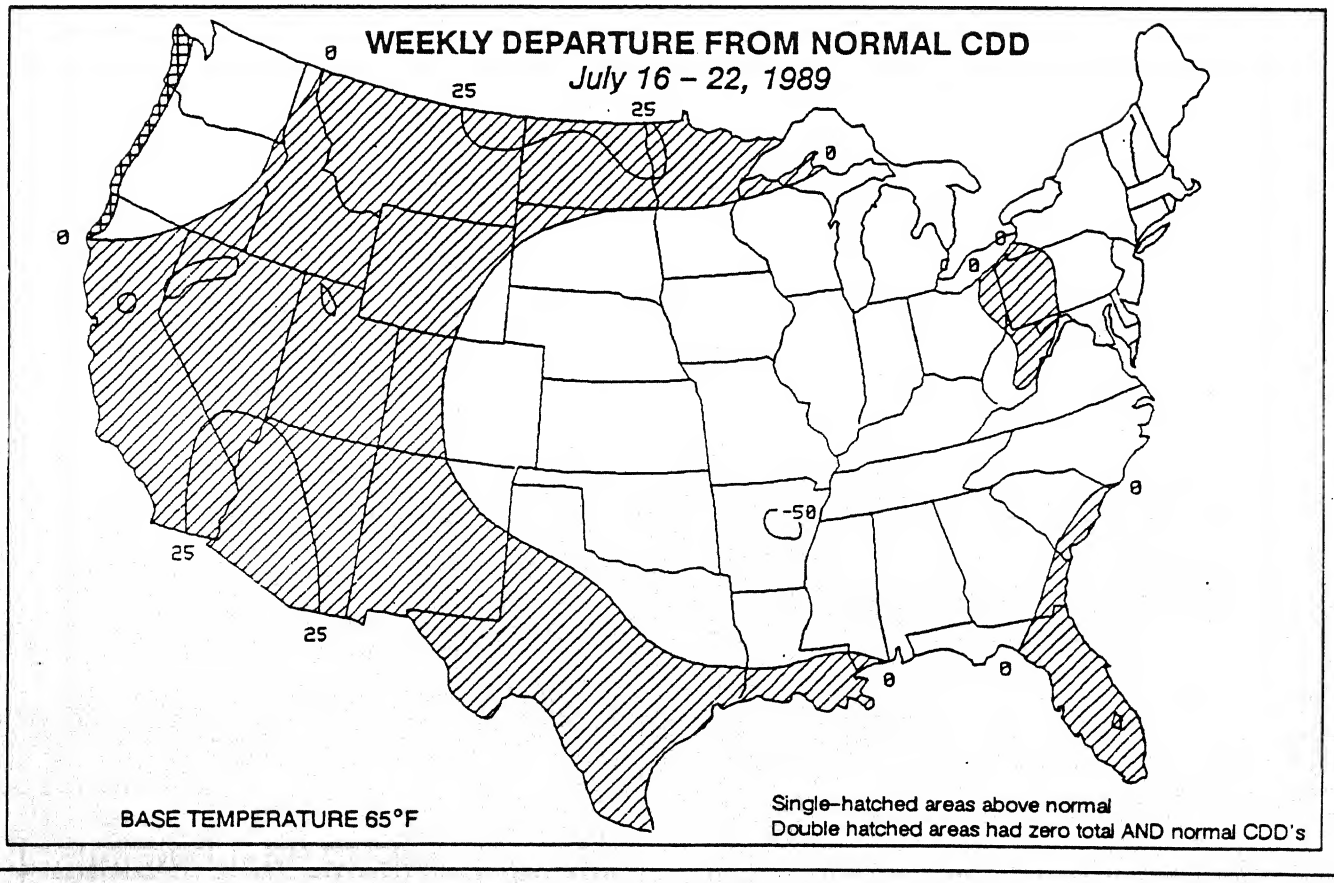


Highs exceeded 100°F across most of the southern Plains, the Southwest, the Great Basin, and a few stations in the northern Plains and Rockies (top). Dangerous apparent temperatures (greater than 105°F) were limited to the south-central and southwestern states (bottom).



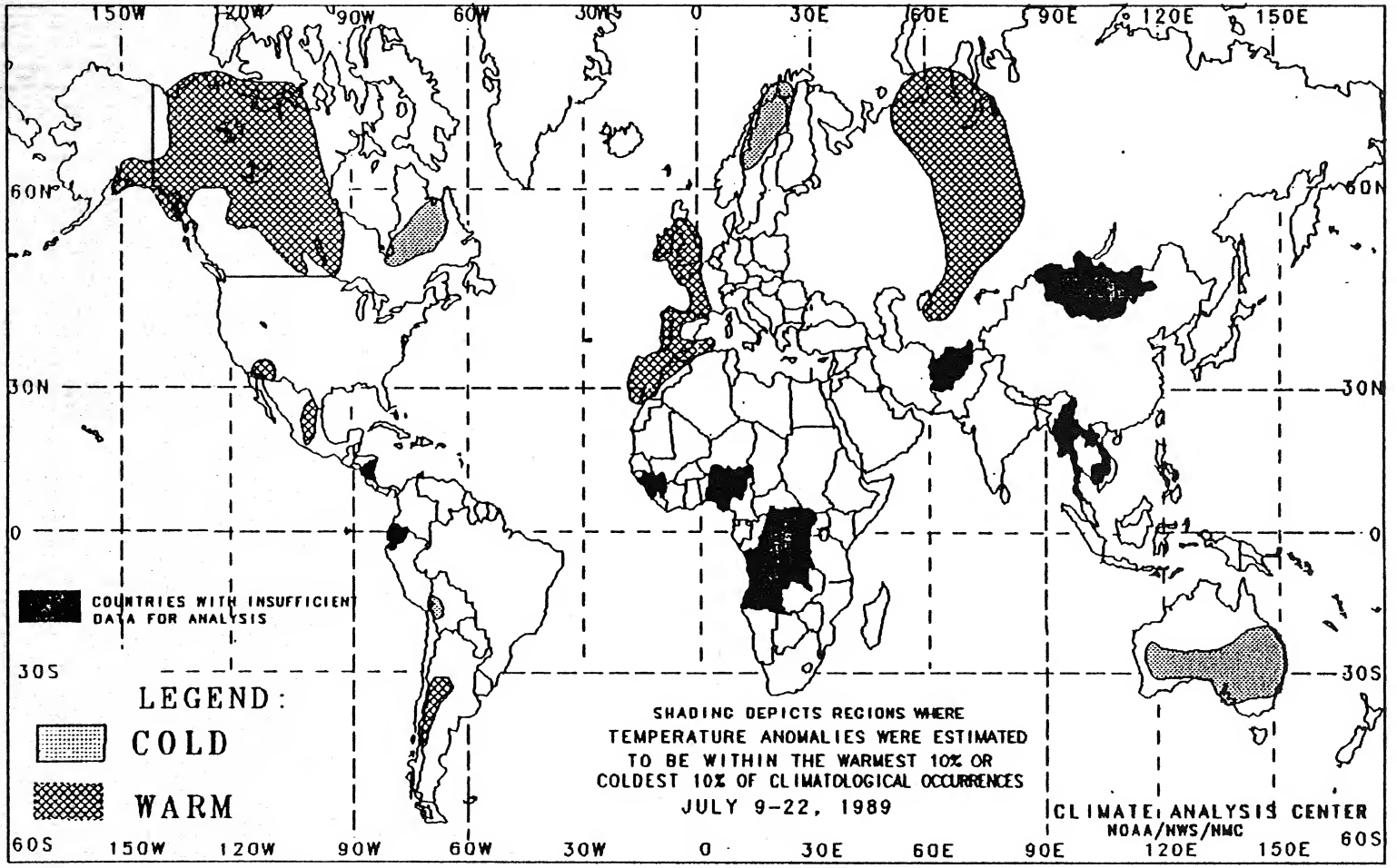


Weekly total CDD's above 100 were limited to the southern tier of states as the desert Southwest recorded CDD's above 200 (top). Most of the nation's midsection experienced subnormal cooling demand while weekly CDD demand was above normal in the desert Southwest, the Rockies, and the northern Great Plains (bottom).



GLOBAL TEMPERATURE ANOMALIES

2 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 13 days of temperature observations were received from synoptic reports. Many stations do not operate on a twenty-four hour basis so many night time observations are not taken. As a result of these missing observations the estimated minimum temperature may have a warm bias. This in turn may have resulted in an overestimation of the extent of some warm anomalies.

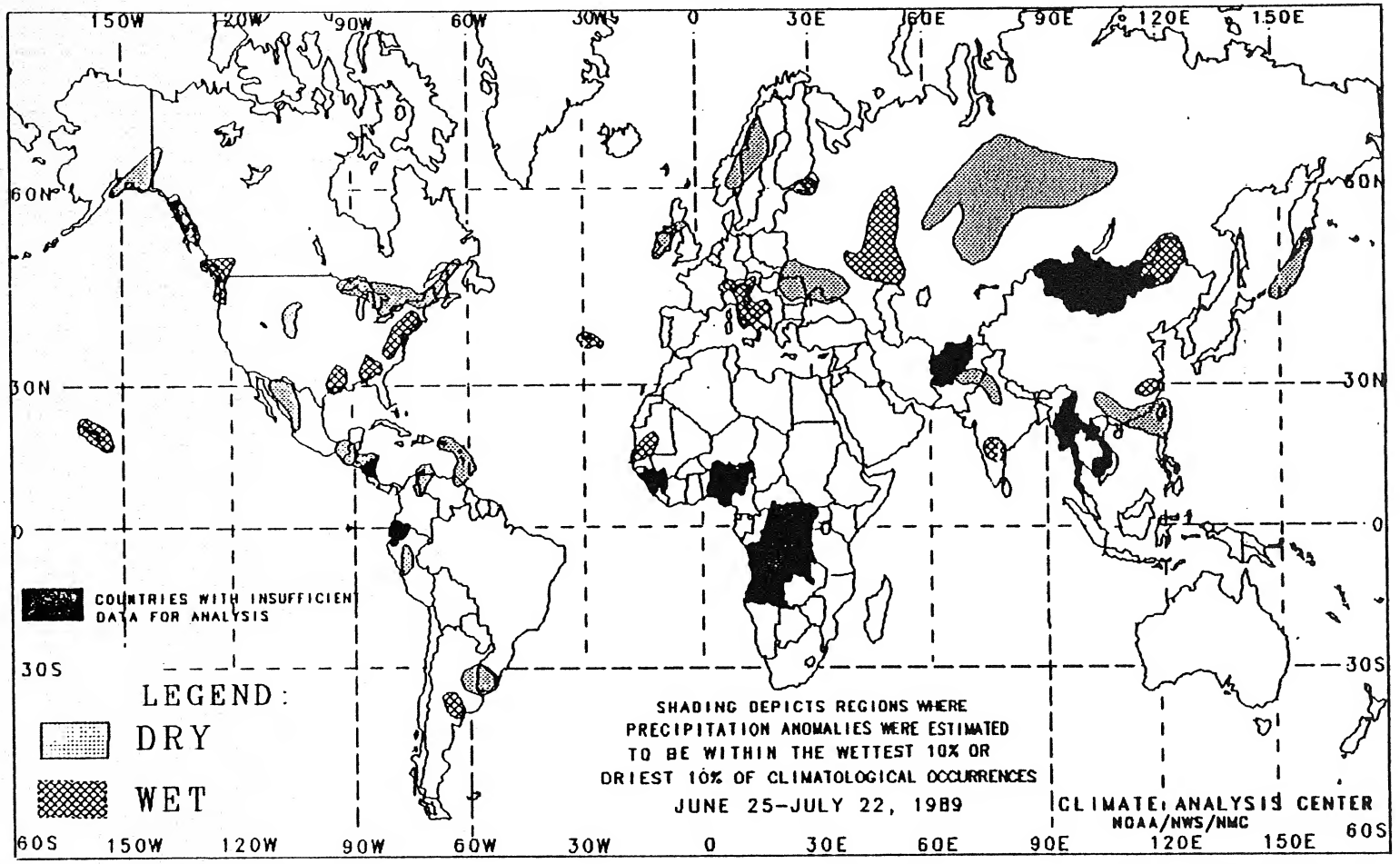
Temperature anomalies are not depicted unless the magnitude of temperature departures from normal exceeds 1.5°C.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

This chart shows general areas of two week temperature anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

GLOBAL PRECIPITATION ANOMALIES

4 WEEKS



The anomalies on this chart are based on approximately 2500 observing stations for which at least 27 days of precipitation observations (including zero amounts) were received or estimated from synoptic reports. As a result of both missing observations and the use of estimates from synoptic reports (which are conservative), a dry bias in the total precipitation amount may exist for some stations used in this analysis. This in turn may have resulted in an overestimation of the extent of some dry anomalies.

In climatologically arid regions where normal precipitation for the four week period is less than 20 mm, dry anomalies are not depicted. Additionally, wet anomalies for such arid regions are not depicted unless the total four week precipitation exceeds 50 mm.

In some regions, insufficient data exist to determine the magnitude of anomalies. These regions are located in parts of tropical Africa, southwestern Asia, interior equatorial South America, and along the Arctic Coast. Either current data are too sparse or incomplete for analysis, or historical data are insufficient for determining percentiles, or both. No attempt has been made to estimate the magnitude of anomalies in such regions.

The chart shows general areas of four week precipitation anomalies. Caution must be used in relating it to local conditions, especially in mountainous regions.

SPECIAL CLIMATE SUMMARY

CLIMATE ANALYSIS CENTER, NMC
NATIONAL WEATHER SERVICE, NOAA

UPDATE ON MOISTURE CONDITIONS IN THE MIDWEST, NORTHERN GREAT PLAINS, AND THE CANADIAN PRAIRIE PROVINCES

Since the last review on moisture conditions in the contiguous U.S. (see Weekly Climate Bulletin (WCB) #89/24 dated June 17, pages 7–10), generous rainfall across most of the South and East has kept much of the area abnormally wet. In contrast, the western Corn Belt and the northern third of the Great Plains continue to experience long-term drought and subnormal precipitation (see WCB #89/21 dated May 27, pages 9–10), although recent rains brought some relief to Iowa, Illinois, and southern Wisconsin (see front cover).

During April 1–July 22, 1989, most of the northern Great Plains, upper Midwest, and the western Corn Belt have received less than 75% of the normal precipitation, and parts of the Dakotas, Iowa, and Nebraska have recorded under 50% (see Figure 1). Total rainfall generally increased from north to south and from west to east (see Figure 2). The greatest negative departures were located in Iowa and Illinois where some stations accumulated deficits exceeding 6 inches (see Figure 3). With inadequate subsoil moisture recharge in the fall and winter of 1988 and subnormal precipitation this growing season, severe to extreme long-term dryness has lingered from the drought of 1988 in the western Corn Belt and the northern Great Plains (see Figure 4). Reports from the Midwest Regional Climate Center indicate that although recent rains have helped topsoil conditions in some sections, the subsoil is still seriously depleted and crops that usually tap this moisture will soon experience problems (see Figure 5).

Farther north, overall moisture conditions in the central Canadian Prairie provinces have improved since the last review (see WCB #89/19 dated May 13, pages 9–12), especially in the central parts of Alberta and Saskatchewan and in southern Manitoba. Increased late spring and early summer rains have raised most locations' accumulated precipitation since April 1 to near or above normal (see Figure 6). The next few weeks will be crucial to successful crop development as timely, ample rainfall and favorable temperatures are imperative. In addition, the heavy rains extinguished forest fires in southern Manitoba; however, northern Manitoba is currently under a state of emergency. According to press reports, lightning, dry weather, and gusty winds have fueled a wildfire approximately 250 miles long and more than 200 miles wide.

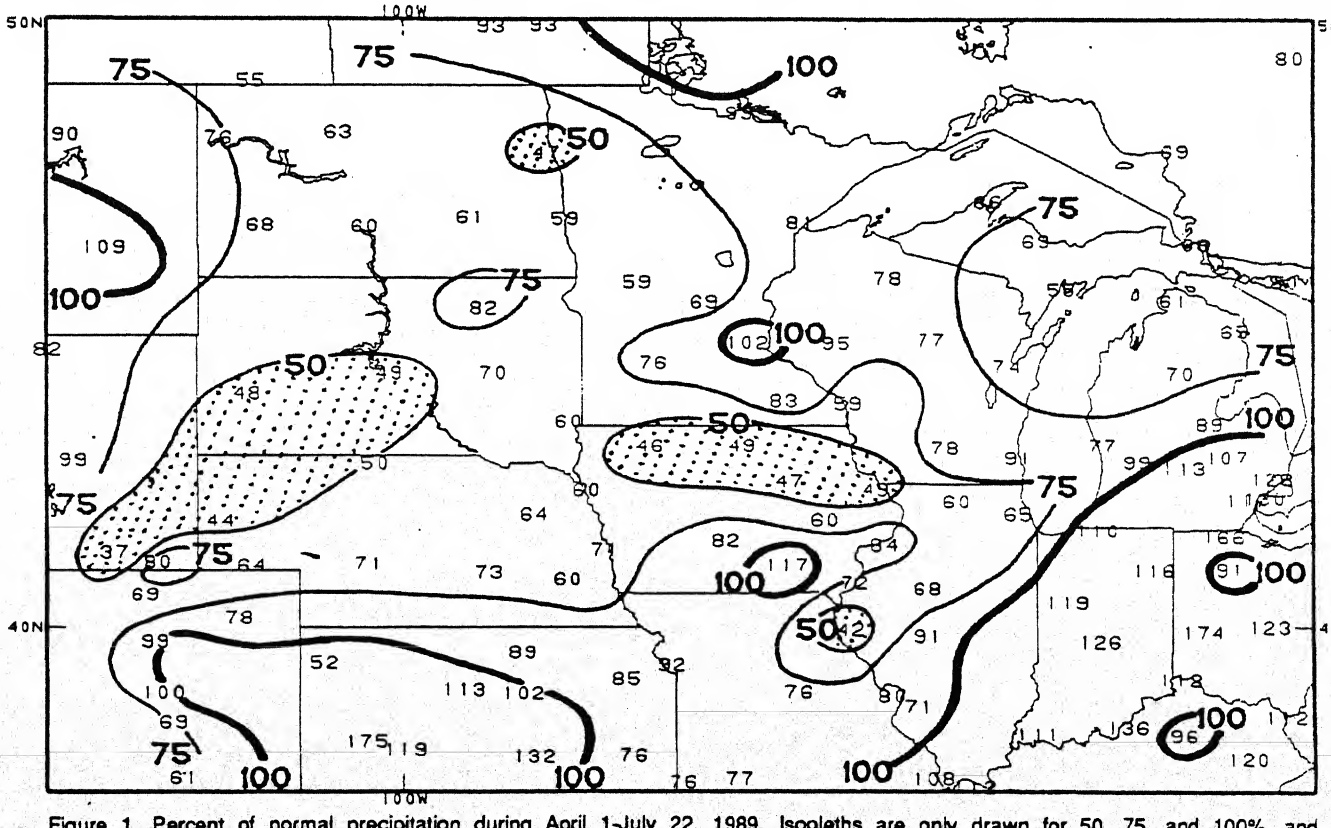


Figure 1. Percent of normal precipitation during April 1-July 22, 1989. Isopleths are only drawn for 50, 75, and 100%, and stippled areas are less than 50%. Subnormal precipitation during this growing season and inadequate soil moisture l last fall and winter has kept most of the western Corn Belt and northern Great Plains in severe or extreme droug

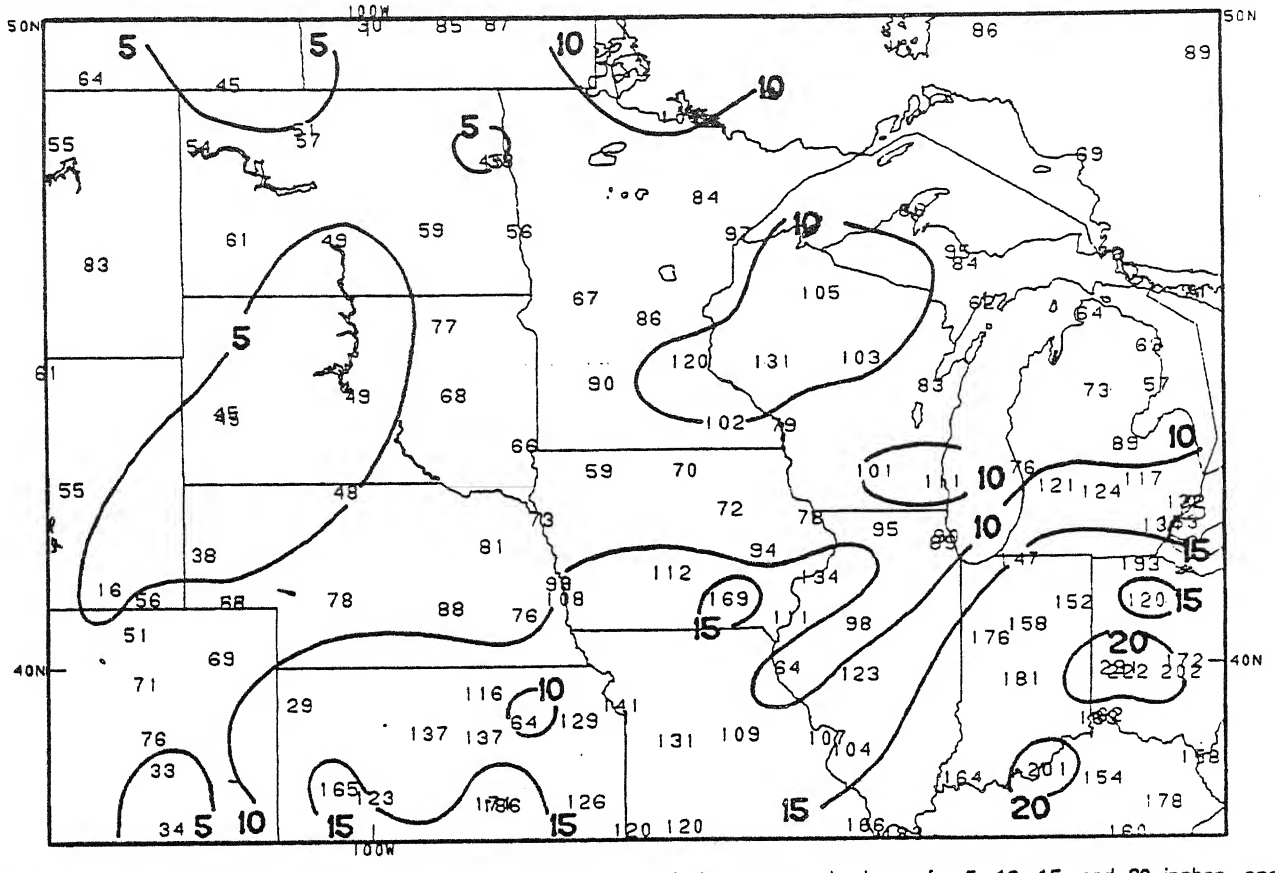


Figure 2. Total precipitation (inches) during April 1-July 22, 1989. Isohyets are only drawn for 5, 10, 15, and 20 inches, and station values are in tenths of inches (e.g. 137=13.7 inches). While parts of the Midwest experienced abnormal dryness, sections of the eastern Corn Belt observed heavy rains and severe flooding.

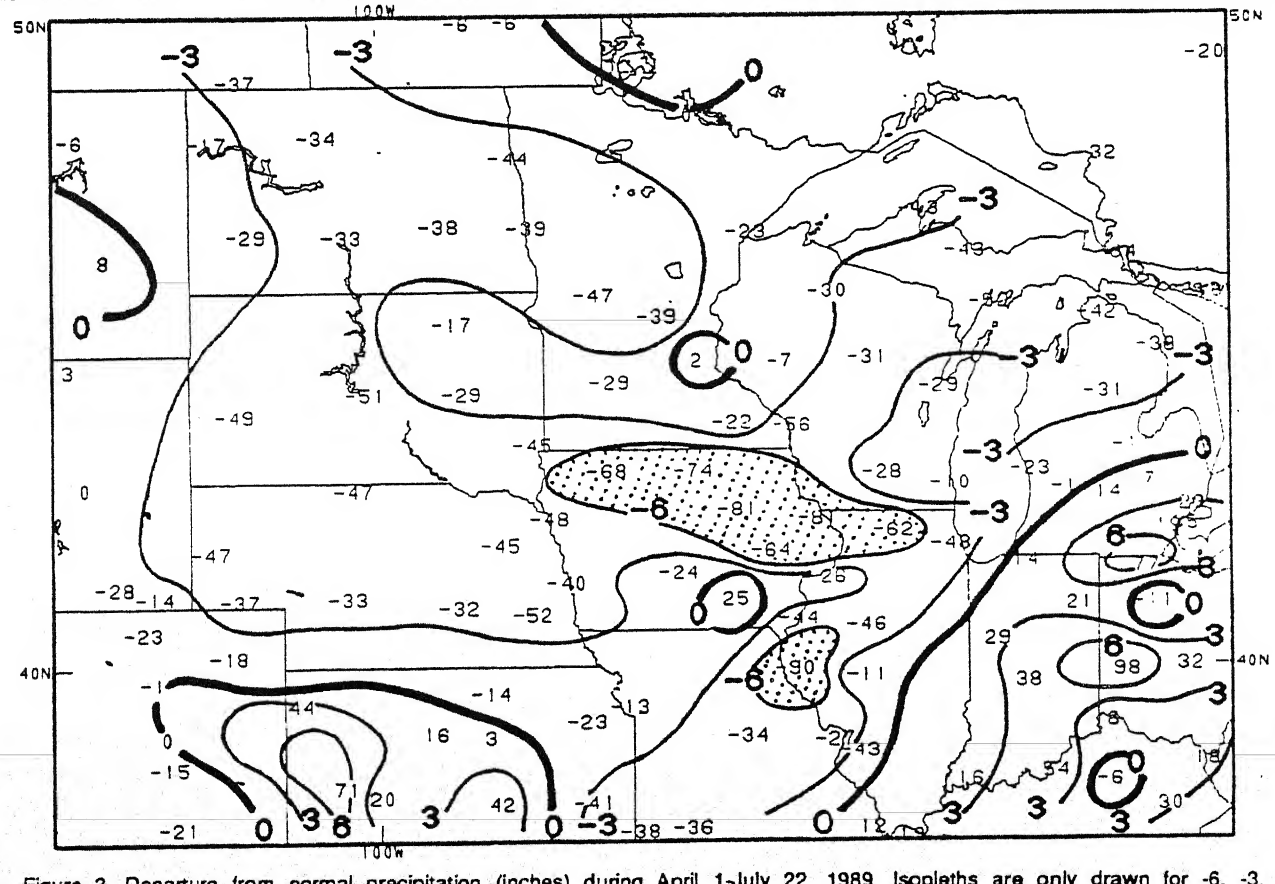


Figure 3. Departure from normal precipitation (inches) during April 1-July 22, 1989. Isopleths are only drawn for -6, -3, 0, 3, and 6 inches, and stippled areas have deficits greater than 6 inches. Parts of Iowa and Illinois have accumulated precipitation deficiencies between 6 and 9 inches during the past 3 1/2 months.

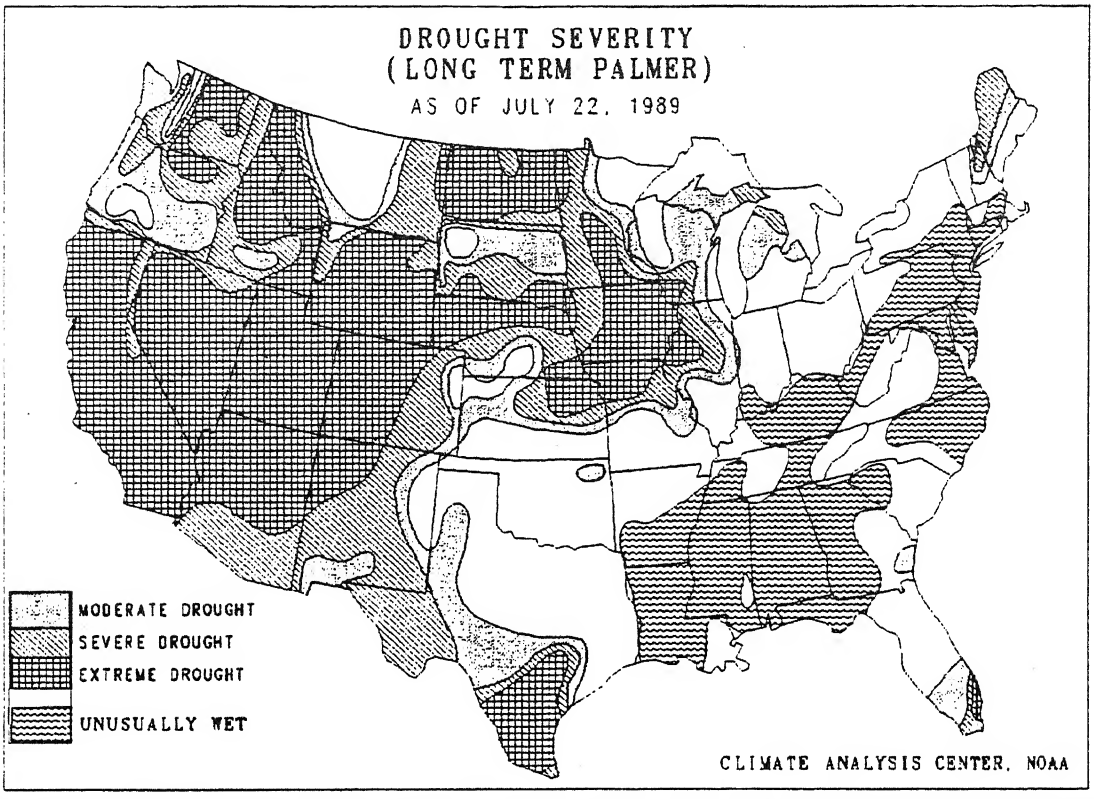


Figure 4. Long-term Palmer Drought Index for the week ending July 22, 1989. While unusually moist conditions prevailed in the East and South, severe or extreme dryness covered the West, the northern Great Plains, and the western Corn Belt.

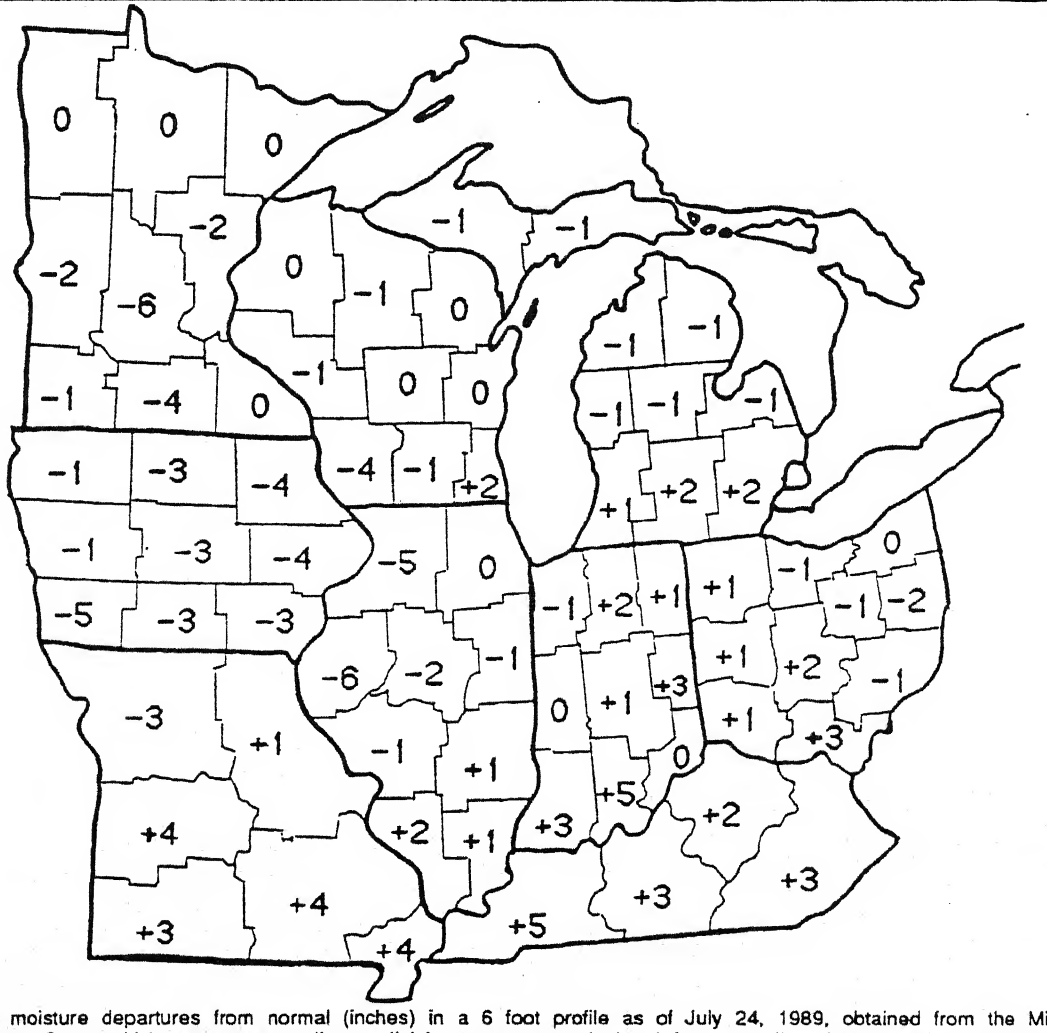


Figure 5. Soil moisture departures from normal (inches) in a 6 foot profile as of July 24, 1989, obtained from the Midwest Regional Climate Center. Values are state climate division averages calculated from a soil moisture model. Similar to the Palmer Drought Index, parts of Iowa and Illinois have large soil moisture deficits.

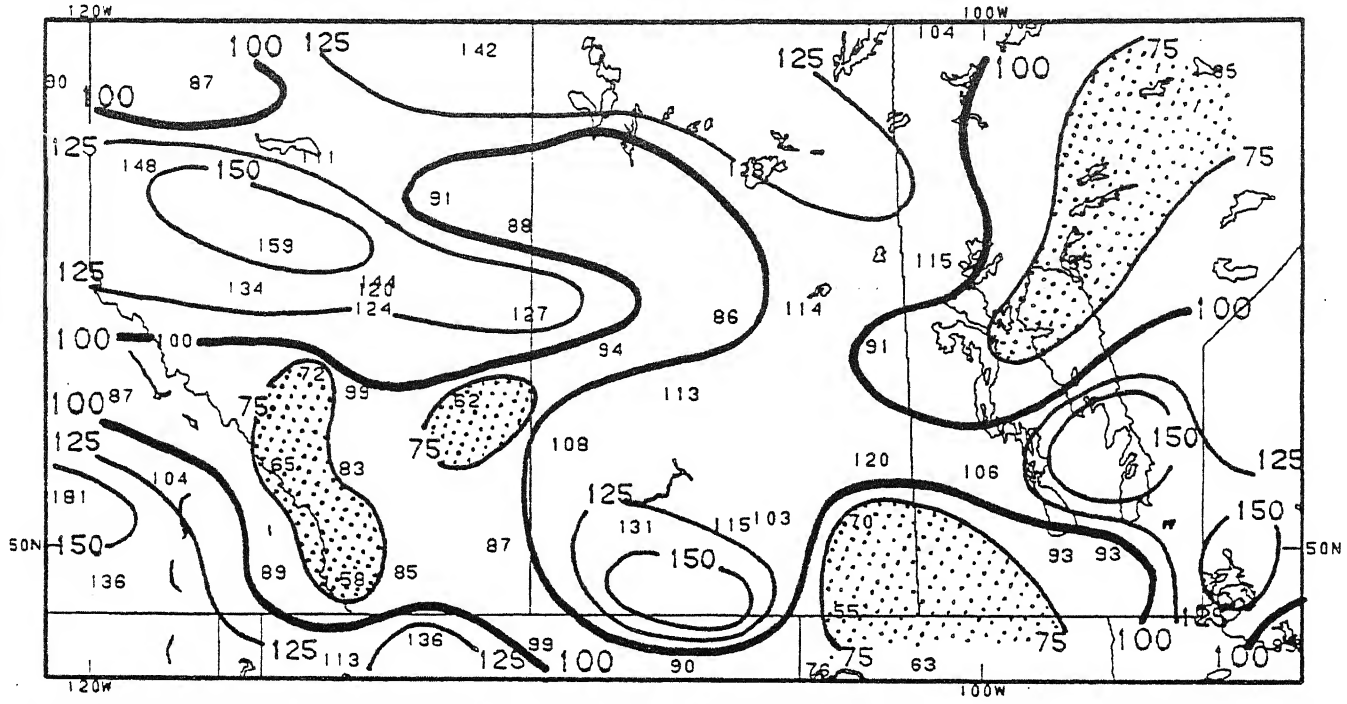


Figure 6. Percent of normal precipitation during April 1-July 22, 1989. Isopleths are only drawn for 75, 100, 125, and 150%, and stippled areas are less than 75%. Supplemental data from the Winnipeg Climate Center are used in the analyses for data-sparce areas. Heavy late spring and early summer rains have improved overall soil moisture conditions in the Canadian Prairie provinces.

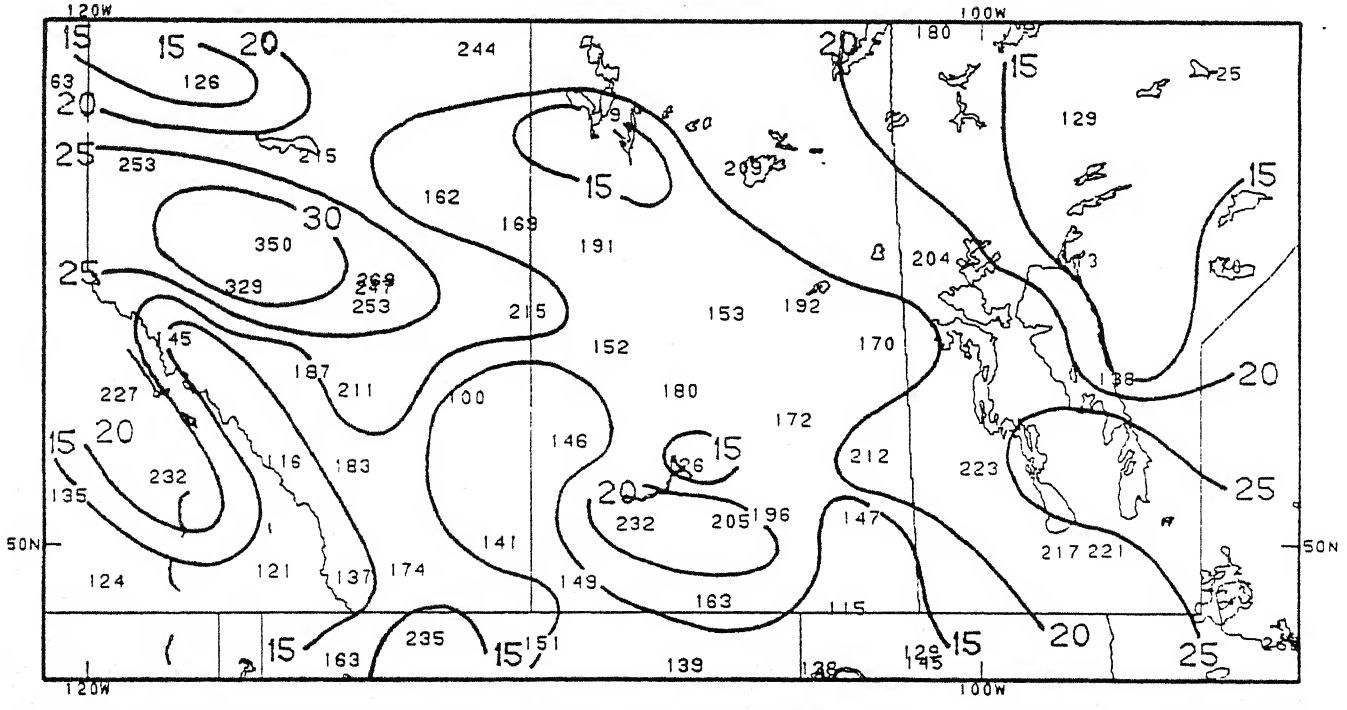


Figure 7. Total precipitation (cm) during April 1-July 22, 1989. Station values are in mm, and isopleths are in cm. Heavy rains in southern Manitoba extinguished forest fires, while generous rains have helped to establish substantial stands of spring wheat, barley, and rapeseed.